<International Research Center for Elements Science> Advanced Solid State Chemistry

International Research Center for Elements Science
- Advanced Solid State Chemistry -

http://msk2.kuicr.kyoto-u.ac.jp

Prof
TAKANO, Mikio
(D Sc)

Assoc Prof
TERASHIMA, Takahito
(D Sc)

Instr
AZUMA, Masaki
(D Sc)

Assoc Instr
YAMAMOTO, Shinpei
(D Eng)

PD (JSPS)
SAITO, Takashi
(D Sc)

PD (PRESTO)
NIITAKA, Seiji
(D Sc)

PD (COE)
ISHIWATA, Shintaro
(D Sc)

PD (COE)
BELIK, Alexei
(D Sc)

PD (JSPS)
WANG, Dan
(D Eng)

Students

MASUNO, Atsunobu (D3)
KANDA, Hironori (D2)
YAMADA, Ikuya (D1)
KANDA, Ryoko (M1)
YAMADE, Satoru (M1)
NINJBADGAR, Tsedev (D3)
KAN, Daisuke (D1)
SHINOKUBO, Masaharu (M2)
HAYAMI, Arata (M1)

Scope of Research

Novel inorganic materials that have new, useful or exotic features such as superconductivity, ferromagnetism and quantum spin ground state are synthesized by novel methods. Recent topics are:

- High-T_c superconducting copper oxides with higher T_c or J_c.
- Perovskite-based compounds with unusual magnetic and electronic properties.
- Low-dimensional spin system showing dramatic quantum effects.

Research Activities (Year 2003)

Presentations

Ligand Holes: $SrFeO_3$ and $(Ca,Na)_2CuO_2Cl_2$, Takano M, International Workshop on Strongly Correlated Transition Metal Compounds, 4 - 7, August.

High Pressure Synthesis and Crystal Structure of Perovskite $BiNiO_3$ and Effects of A-Site Substitution, Ishiwata S, Azuma M, Kato K, Nishibori E, Vacate M, Skated M, Takano M, Joint 19th AIRAPT-41st EHPRG International Conference on High Pressure Science and Technology, 7 - 11, August.

High-pressure Synthesis and Physical Properties of Bi-Contained Transition Metal Oxides $BiCrO_3$, and $BiCoO_3$, Niitaka S, Azuma M, Takano M, Nishibori E, Takata M, Sakata M, Joint 19th AIRAPT-41st EHPRG International Conference on High Pressure Science and Technology, 7 - 11, August.

Single Crustal Growth of $PrNiO_3$ Perovskite at 4.5 GPa and the Study of its Metal-Insulator Transition, Saito T, Azuma M, Nishibori E, Takata M, Sakata M, Nakayama N, Arima T, Kimura T , Urano C, Takano M, Joint 19th AIRAPT-41st EHPRG International Conference on High Pressure Science and Technology, 7 - 11, August.

Blue-Light Emission from $SrTiO_3$

Blue-light emission was observed from $SrTiO_3$ single crystal with oxygen deficiencies caused by Ar^+ ion beam irradiation. Emission intensity increased with the increase of Ar^+ irradiation time. New electronic state (E=2.8eV) is generated by the Ar^+ irradiation. Light emission of $SrTiO_3$ might be caused by the excitonic mechanism. Light emission devices with short wave length and high power using Ti^{3+} containing perovskite are expected in the future.

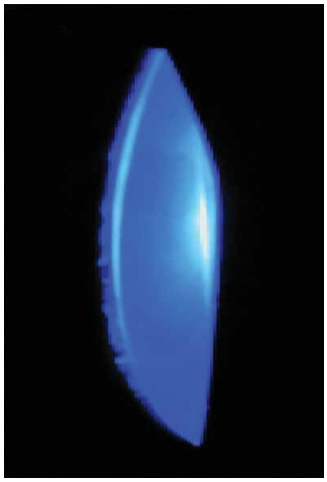

Figure 1. Cathode luminescence of $SrTiO_3$.

Cubic FePt nanoparticles

Colloidal nanoparticles are promising candidates in a wide range of technological applications and have been the subject of numerous works. Although synthetic works have focused on the preparation of monodisperse spherical nanoparticles with a controlled size, physical and chemical properties are mostly dependent not only on size but also on shape. We have succeeded in synthesizing monodisperse FePt nanoparticles with a *cubic* shape for the first time based on a simple organic-phase reaction. 2-D array of the present cubic nanoparticles can be a promising candidate for a "bit per particle" data storage media.

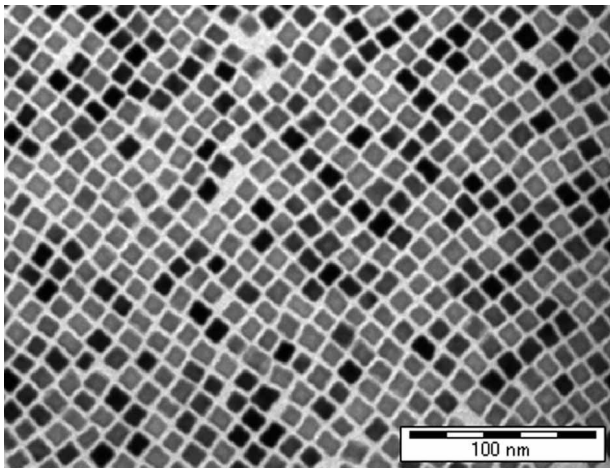

Figure 2. FePt nanoparticles with a cubic shape.

Grants

Takano M, Development of 3d transition-metal oxides with oxygen p holes. Grant-in-Aid for Scientific Research (A) (2), 1 April 2002 - 31 March 2005.

Terashima T, Electric field induced superconductivity in the FET devices using ultrathin $SrTiO_3$ single-crystal substrate with high dielectric constant. Grant-in-Aid for Scientific Research (B) (2), 1 April 2002 - 31 March 2004.

Terashima T, Preparation and properties of epitaxial thin films of oxides containing transition-metal ions in unusually high-valence states, Priority Area Grants from the Ministry of Education, Science, Culture and Sport of Japan, 1 April 2000 - 31 March 2004.

Azuma M, Exploration of photo-functions in strongly correlated electron systems of transition metal oxides, PRESTO, 1 December 2001 - 31 November 2004.

Awards

Takano M, 2002 JSPM Award for Distinguished Achievements in Research, Discovery of Novel 3d-Transition Metal Oxide: High-Pressure Synthesis, The Japan Society of Powder and Powder Metallurgy, 21 May 2003.

Ishiwata S, The ICR Award for Students, High Pressure Synthesis and Crystal Structure of Perovskite $BiNiO_3$, and Suppression of A-site Charge Disproportionation by La-substitution, ICR, 5 December 2003.